

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
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RESEARCH ON INSULATION PROPERTIES OF HIGH-SPEED AIRCRAFT LIGHTWEIGHT
HEAT-RESISTANT MATERIALS IN HIGH-TEMPERATURE ENVIRONMENT

Abstract

Abstract: Lightweight materials are widely used in missiles and other high-speed aircrafts for thermal protection. As the actual lightweight heat-resistant materials differ in density, quality, technology, production batches and other aspects, the piecewise discrete thermal conductivities provided by the manufacturer are normally quite different from actual values of the materials. In this paper, in order to provide reliable thermal conductivities suitable for accurate numerical simulation, a high-temperature thermal conductivity measuring device was established for lightweight heat-resistant materials. Moreover, using nonlinear relationship between the temperature and thermal conductivity obtained by experimental method, the heat insulation effect of lightweight high temperature heat-resistant ceramic materials was numerically simulated by FEM. And the heat-resistant materials mentioned above were also tested by the transient aerodynamic heating simulation experimental system, and comparison between the results of calculation and experiment was carried out. There is satisfactory agreement between calculation and experiment. It indicates that more accurate calculated results can be obtained by using the nonlinear relationship between temperature and the thermal conductivity measured. The study above lays a solid basis for replacing costly transient aerodynamic heating simulation testing using numerical simulation.